

Water Quality Targets

The IDEM Watershed Management Plan (WMP) Checklist (2009) requires groups to identify targets for water quality parameters of concern. A target is defined as the desired measured level of a water quality or habitat/biological parameter that a group has decided streams in the watershed should meet.

Where an Indiana Water Quality Standard or TMDL exists for a parameter of concern, the watershed group must, at a minimum, set the target to meet the respective standard or the loading limit set in the TMDL. Groups obviously are welcome to set more stringent targets if they wish. Figure 1 shows water quality parameters watershed groups are often concerned with and which have an Indiana Water Quality Standard. A complete list of Indiana's Water Quality Standards can be found in the [Indiana Administrative Code](#).

Many of the water quality parameters watershed groups are concerned with do not have a standard. In these instances groups are free to set whatever target they deem appropriate, but that freedom can be overwhelming given the myriad of targets being used across the county. This guidance does not attempt to tell watershed groups what targets to choose, but rather, lists in Figure 2 several targets used by other watershed groups in Indiana and the source of those targets. IDEM hopes this information helps watershed groups wisely choose water quality targets for their specific watershed.

Figure 1

Parameter	Target	Reference/Other Information
Total Ammonia (NH₃)	Range between 0.0 and 0.21 mg/L depending upon temperature and pH	Indiana Administrative Code (327 IAC 2-1-6)
Atrazine	Max: 3.0 ppb Min: 4.0 mg/L	U.S. EPA Drinking Water Standard Indiana Administrative Code (327 IAC 2-1-6)
Dissolved Oxygen (DO)	Max: 12.0 mg/L Min: 6.0 mg/L in coldwater fishery streams	Indiana Administrative Code (327 IAC 2-1.5-8)

	Min: 7.0 mg/L in spawning areas of coldwater fishery streams	Indiana Administrative Code (327 IAC 2-1.5-8)
	Max: 235 CFU/100mL in a single sample	Indiana Administrative Code (327 IAC 2-1.5-8)
E. coli	Max: <u>Geometric Mean</u> of 125 CFU/100mL from 5 equally spaced samples over a 30-day period	Indiana Administrative Code (327 IAC 2-1.5-8)
Nitrate	Max: 10 mg/L in waters designated as a drinking water source	Indiana Administrative Code (327 IAC 2-1-6)
Nitrite	Max: 1 mg/L in waters designated as a drinking water source	Indiana Administrative Code (327 IAC 2-1-6)
Nitrate-N + Nitrate-N	Max: 10 mg/L in waters designated as a drinking water source	Indiana Administrative Code (327 IAC 2-1-6)
Temperature	Dependant on time of year and whether stream is designated as a cold water fisheries	Indiana Administrative Code (327 IAC 2-1-6)

Figure 2

Parameter	Target	Reference/Other Information
Nitrate-nitrogen (NO3)	Max: 0.633 mg/L	U.S. EPA recommendation * Ohio EPA recommended criteria for Warm Water Habitat (WWH) headwater streams in Ohio EPA Technical Bulletin MAS//1999-1-1 [PDF]
		Dividing line between mesotrophic and eutrophic streams (Dodds,

	1.5 mg/L	W.K. et al., 1998, Table 1, pg. 1459, and in EPA-822-B-00-002 [PDF] , p 27.)
	10.0 mg/L	IDEM draft TMDL target based on drinking water targets
Ortho-Phosphate also known as Soluble reactive phosphorus (SRP)	Max: 0.005 mg/L	Wawasee Area Conservancy Foundation recommendation for lake systems, NESWP344
Suspended Sediment Concentration (SSC)	Max: 25.0 mg/L	U.S. EPA recommendation for excellent fisheries
	Range: 25.0-80.0 mg/L	U.S. EPA recommendation for good to moderate fisheries
Total Kjeldahl Nitrogen (TKN)	Max: 0.591 mg/L	U.S. EPA recommendation *
	Max: 0.076 mg/L	U.S. EPA recommendation
	0.07 mg/L	Dividing line between mesotrophic and eutrophic streams (Dodds, W.K. et al., 1998, Table 1, pg. 1459, and in EPA-822-B-00-002 [PDF] , p 27.)
Total Phosphorus		Ohio EPA recommended criteria for Warm Water Habitat (WWH) headwater streams in Ohio EPA Technical Bulletin MAS//1999-1-1 [PDF]
	Max: 0.08 mg/L	
	Max: 0.3 mg/L	IDEM draft TMDL target
	Max: 80.0 mg/L	Wawasee Area Conservancy Foundation recommendation to protect aquatic life in lake systems
Total Suspended Solids (TSS)	Max: 30.0 mg/L	IDEM draft TMDL target from NPDES rule for lake dischargers in 327 IAC 5-10-4 re: monthly average for winter limits for small sanitary treatment plants
	Range: 25.0-80.0 mg/L	Concentrations within this range reduce fish concentrations (Waters, T.F.,, 1995). Sediment in streams: sources, biological effects and

		control. American Fisheries Society, Bethesda, MD. 251 p.
	Max: 40.0 mg/L	New Jersey criteria for warm water streams
	Max: 46.0 mg/L	Minnesota TMDL criteria for protection of fish/macroinvertebrate health
Turbidity	Max: 25.0 NTU	Minnesota TMDL criteria for protection of fish/macroinvertebrate health
	Max: 10.4 NTU	U.S. EPA recommendation

* U.S. EPA recommended criteria are different for parts of southwest Indiana within Ecoregion IX. See [Ecoregional Nutrient Criteria Documents for Rivers & Streams](#) for more information.

Geometric Mean: The geometric mean, in mathematics, is a type of mean or average, which indicates the central tendency or typical value of a set of numbers. It is similar to the arithmetic mean, which is what most people think of with the word "average," except that instead of adding the set of numbers and then dividing the sum by the count of numbers in the set, n , the numbers are multiplied and then the n th root of the resulting product is taken. A geometric mean, unlike an arithmetic mean, tends to dampen the effect of very high or low values, which might bias the mean if a straight average (arithmetic mean) were calculated. This is helpful when analyzing bacteria concentrations, because levels may vary anywhere from 10 to 10,000 fold over a given period.

Geometric Mean Formula:

Geometric Mean = $((X_1) \cdot (X_2) \cdot (X_3) \cdot \dots \cdot (X_N))^{1/N}$
where

X = Individual score

N = Sample size (Number of scores)

Geometric Mean Example:

Use the following set of values - 1, 2, 3, 4, and 5 to find the Geometric Mean.

- Step 1: Find $1/N$
 - a. $N = 5$, the total number of values

- b. Using the above value, $1/5 = 0.2$
- Step 2: Calculate the Geometric Mean
 - a. $((1)*(2)*(3)*(4)*(5))^{0.2} = (120)^{0.2}$
 - b. Geometric Mean = 2.60517

The Indiana Administrative Code uses the Geometric Mean as a calculation for five evenly spaced samples of E. coli over 30-days in order to determine compliance with the water quality standard.

In Microsoft Excel, the equation for geomean is =Geomean(Xx:Yy)